WHAT IS CLAIMED IS:

1. An automatic programming apparatus for generating an NC program for causing a cutting tool to machine a workpiece into a product shape having a recess and one or more protrusions formed in the bottom surface inside the recess, said automatic programming apparatus comprising:

a product shape data storing section for storing shape data defining said product shape;

a workpiece data storing section for storing data concerning the workpiece such as the shape and the material of said workpiece;

a tool data storing section for storing data concerning the tool such as the type, the dimension, and the material of said tool;

a machining condition data storing section for storing data concerning a machining condition having been set depending on said workpiece and tool;

a CL data generating section for setting machining regions and then generating CL data containing at least a tool to be used, the feed speed thereof, and the traveling positions of said to-be-used tool in a work coordinate system for each of said machining regions having been set, on the

basis of said data stored in said product shape data storing section, said workpiece data storing section, said tool data storing section, and said machining condition data storing section; and

an NC program generating section for generating an NC program on the basis of the traveling positions in the work coordinate system contained in the CL data generated by said CL data generating section; wherein

said automatic programming apparatus further comprises:

a concave portion machining tool storing section for storing the identification data of a plurality of tools that are selected in advance as tools to be used for the machining of said recess from among the tools the data of which is stored in said tool data storing section, and that have diameters different from each other and include at least: a minimum diameter tool having a diameter smaller than twice the minimum curvature radius of the concave surfaces inside said recess of said product and than the minimum distance of the wall gaps inside said recess; and a tool having a larger diameter than the minimum diameter tool; and

a machining time calculating section for

calculating the machining time on the basis of the CL data generated by said CL data generating section; wherein

when the machining region having been set is said recess, said CL data generating section performs successively: a combination setting process of referring to the identification data stored in said concave portion machining tool storing section, thereby extracting one or more tools from among a plurality of said tools selected in advance, and thereby setting a plurality of tool combinations including at least said minimum diameter tool; and a CL data generating process of generating, for each of said combinations having been set, rough cutting CL data for rough cutting performed by the successive use of the tools in the descending order of tool diameter starting with the tool having the maximum diameter, and then generating finishing CL data for finishing performed by the use of said minimum diameter tool; wherein

said machining time calculating section calculates the machining time for each of said combinations on the basis of the CL data generated for each of said combinations; and wherein

said NC program generating section generates said NC program by using the CL data having the minimum machining time among those calculated by said machining time calculating section.

2.   An automatic programming apparatus according to Claim 1, wherein

said concave portion machining tool storing section groups into a tool group a plurality of said tools selected as those to be used for the machining of said recess, and then stores the identification data of the constituent tools for each of said tool groups the constituent tools of which are different from each other, and wherein

said CL data generating section receives from the outside a signal for selecting one from among a plurality of said tool groups, then refers to the identification data of said tool group corresponding to said selection signal, stored in said concave portion machining tool storing section, and thereby performs said combination setting process and said CL data generating process successively.